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SYSTEM-WIDE MEASURES OF MODERNIZATION SUCCESS

Jack Russell

Jack Russell is President of The Modernization Forum, a national alliance of manufacturing extension centers including most of the centers associated with the NIST Manufacturing Extension Partnership.

Is the assurance implied in the title I have been assigned now proper? Is an American industrial modernization infrastructure sufficiently a building to merit the heady reference to "system-wide" measures of success? Rapidly rising federal investment in MEP-linked centers creates the possibility of a national manufacturing extension system. The NIST MEP's enlightened federalism and commitment to LINKS can provide political and technical support for a national system. Perhaps, in the autumn of 1994, we are allowed to believe we can get there from here -- with milestones to mark the passage.

As a framework for my contribution to this conference, let me restate four convictions about the mission to modernize America's industrial base:

1. ***Scale Is Essential***. Manufacturing in America will be stronger only if a *significant segment* of the 375,000+ small and midsized manufacturing establishments (SMEs) in the United States improve their design, production, and marketing capabilities, the skills of the workforce, and the management methods that focus the firm. Some 20-30% of the industrial base must continuously modernize to propel a long-term rise in SME productivity growth rates.
2. ***Infrastructure Is Required.*** Market forces alone will not drive industrial base modernization on the scale necessary in the 1990s. We must build a nation-wide manufacturing extension partnership based on at least 100 centers that have become respected allies for 75,000-100,000 modernizing firms. Publicly supported extension centers serving regional (sub-state) manufacturing endowments are necessary because no other entity can devote the resources required to assist such a large and diverse customer base.
3. ***Stakeholders Must Cooperate.*** Center-supported industrial base modernization on the scale necessary is not possible without sustained cooperation from several kinds of stakeholders. *Stakeholders* are groups of kindred organizations that have a strong objective interest in improving the

performance of small and midsized manufacturers. Among the most important groups of stakeholders are:

large industrial corporations that purchase substantial inputs from SMEs,

producers (vendors) of industrial technology interested in serving the huge potential market of SMEs,

trade associations that serve the needs and represent the interests of SMEs,

labor unions concerned with the contribution of SMEs to the U.S. economy,

financial institutions invested in industrial regions, and

utilities that serve a broad base of industrial customers.

If properly engaged, each of these and other groups of stakeholders can draw advantages from and bring resources to the growing national network of manufacturing extension centers. Links to such stakeholders can become the most important components of a robust nation-wide "system" sustaining modernization of the industrial base.

4. ***Extension Centers Must Orchestrate Regional Alliances of Stakeholders***. Stakeholder cooperation should enable some national-scale programs in specific industries and sectors, but the most rewarding arena for consortial action among multiple stakeholders in industrial modernization will be the regions served by larger centers. The large centers responsible for full states or major metropolitan regions are the organizations best suited to convene stakeholder alliances and to orchestrate their complex and at times contending interests. Large centers can organize regional cooperation by stakeholders because they have the public mandate to serve the general interests of the region, the political resources of their state and local sponsors, and the funding to underwrite serious work with thousands of small and midsized firms.

I believe most conferees share my first two convictions and hope many will agree with the latter two. Those who concur in all four will envision the fully-developed manufacturing extension system as a federally-supported partnership of many regional alliances in which strong centers work in dynamic cooperation with several stakeholder organizations.

The character of center-orchestrated stakeholder alliances will of course vary from region to region based on industrial mix and the distribution of stakeholder organizations (e.g. trade associations, vendors, unions). The mature U.S. manufacturing modernization system will, however, engage the cooperation of all important private sector players with an objective interest in improved SME performance. I believe that will be our best test of maturity.

How far have we come toward this goal? If we make 1994 our baseline, we begin with modest experience in stakeholder relations. In the first five years of what we now call the NIST Manufacturing Extension Partnership, center leaders have necessarily focused on the hard work required just to launch and establish new organizations. Stakeholder links have typically been confined to pilot projects between centers and an individual OEM, trade association, or vendor. From 1994 on, as many new centers join the MEP and as established centers mature, the scale of our national network should make cultivation of stakeholder relations easier.

How should progress toward a stakeholder-engaging mature manufacturing modernization system be measured? And by whom? Point of view is obviously important in evaluating progress in stakeholder cooperation. Within the framework of relations with six distinct stakeholder groups, I suggest below some milestones and means to confirm progress from three view points, those of the:

Regional Center seeking to measure and improve its performance in engaging stakeholders from the group,

Stakeholder Organization assessing returns on its investment in cooperation with a center and regional alliance, and

National Sponsor (Congress/Commerce/ NIST) evaluating the scale and value of nation-wide cooperation with the stakeholder group.

In order to respect the space limits for conference papers, I have done the exercise in modest scope for large industrial corporations but offer only one milestone and means of confirmation [in brackets] per point of view for the other stakeholder categories.

Some Possible Milestones and Means to Confirm Progress in Stakeholder Cooperation

Large Industrial Corporations

Regional Center

* knows the regional presence of all large manufacturing corporations facility by facility and has made contact with XX% of the plant managers and senior purchasing personnel in the region [center database of facilities; interviews with large manufacturers]
* can describe a significant component of the regional SME supplier base (both direct and indirect) used by each major manufacturer in its region [center database, agent testimony]
* understands how regional suppliers view each major manufacturer in the region [agent testimony; interviews with suppliers]
* has conducted a documented discussion of specific SME supplier base needs (e.g. quality certification, EDI implementation) with XX% of the major manufacturers in the region [center meeting reports; interviews with large manufacturers]
* has completed a project with a major manufacturer in the region [project documentation, report]
* XX% of center business is with major manufacturers in the region [center quarterly reports]
* has established a permanent senior liaison with XX% of the major manufacturers in the region [center database; interviews with major manufacturers]
* senior liaisons from major manufacturers meet in a regular, structured mode with: a) one another, b) representatives from common suppliers, c) other stakeholders convened by the center. [meeting records]

Stakeholder Organization (Large Manufacturer in Region)

* understands the stated capabilities of the center that are relevant to manufacturer's needs in the region [interview with manufacturer, review of center Statement of Capabilities]
* has confirmed the center as a cost-effective means for disseminating information to the manufacturer's current and potential suppliers in the region [interview with manufacturer; records of center dissemination projects]
* has confirmed the center as a cost-effective means to carry out some supplier improvement projects with direct or key indirect suppliers [interview with manufacturer; center assistance projects]
* has confirmed the center as a viable source of qualified candidate suppliers [manufacturer testimony; % of newly qualified suppliers referred by center]
* values the center as a means for establishing common (neutral) ground for dialogue with its regional suppliers [manufacturer testimony; records of communications, meetings with suppliers]
* values the center as a facilitator of consortial action with other major manufacturers in the region [participation in multipartite stakeholder council and projects]
* values the center as the channel through which the manufacturer cooperates with other organizations in the region that can help improve the performance of their regional suppliers [participation in multipartite stakeholder council and projects]

National Sponsor

* a national council of leading representatives from major manufacturers meets with directors from the larger centers and from NIST to scope opportunities for regional (and national) cooperation and to stimulate regional collaboration (Note: The Modernization Forum will try to convene

several stakeholder councils in 1994-96) [council convened]

* XX% of larger manufacturing extension centers have conducted a successful project with a major manufacturer in their region [center quarterly reports]
* XX% of Fortune 500 manufacturing corporations have been engaged in a center project in at least one region [center reports; survey of manufacturers]
* XX% of Fortune 500 manufacturing corporation plants have benefitted from the work of the center in their region [center reports; survey of manufacturer plant managers]
* major manufacturers routinely come to the manufacturing extension partnership to explore how the national network of centers can help address their objectives regarding the broad SME supplier base (e.g. standards promulgation, electronic communication) [testimony of NIST, centers, Forum]

Producers (Vendors) of Industrial Technology

Regional Center

* through analysis of the regional base it serves, has identified 2-3-4 technologies where deployment of new best practice will do most to enable modern manufacturing in the region, and through analysis of its own assistance projects can harvest insights on SME use of these technologies that have unique value for the vendors most likely to develop new best practice [documented center methodology to identify priority enabling technologies; consistently applied protocol for extracting lessons from projects]

Stakeholder Organization

* has developed a successful new product for SMEs based in part on market analysis and a functional specification enhanced by its cooperation with the network of manufacturing extension centers [shorter time to market; broader acceptance of product by SMEs; stronger return on investment in product development]

National Sponsor

* XX% of the top twenty vendors of technologies relevant to SMEs have developed successful new products based in part on cooperation with the national manufacturing extension partnership [vendor testimony]

Trade Associations

Regional Center

* maintains regular contact with regional leadership of trade associations representing SMEs important to the region, develops educational programs in cooperation with chapters and national offices of associations, and has conducted assistance projects with 20% of the regional membership of the three associations representing sectors most important to the region [survey of association chapters; center quarterly reports]

Stakeholder Organization

* XX% of national membership has received valued service from a manufacturing extension center [survey of association membership]

National Sponsor

* XX% of trade associations with the ten largest SME memberships each report that at least 10% of their membership have received a valued service from a manufacturing extension center and independent analysis confirms that at least 75% of them out-perform otherwise comparable unassisted firms [survey of association memberships; performance benchmarking reports]

Labor Unions

Regional Center

* maintains regular contact with regional labor councils, leaders of union locals at large plants with substantial regional supplier chains, and unions representing workers at SMEs in the region; frequently involves union in assistance projects at organized firms; has center staff and/or partnerships with service providers that can support workforce development and high performance

work organization at assisted SMEs; [surveys of unions; center quarterly reports]

Stakeholder Organization

* XX% of locals have been engaged by a center in education or assistance projects; % of center projects at represented plants where the union was a party to the project; incremental closure of productivity and wage gaps between larger (often union organized) and SME (seldom organized) manufacturing establishments [survey of locals; Census of Manufacturers]

National Sponsor

* XX% of the top ten national unions with the largest organized bases at SMEs each confirm that at least 10% of their locals have participated in and benefitted from a manufacturing extension center activity [union testimony; survey of locals]

Financial Institutions

Regional Center

* senior liaison established with each major regional bank; XX% of prospect referrals from banks; conducts professional development exchanges between center consulting staff and bank loan officers; center SME customers have higher loan acceptance and lower default rates than those for comparable unassisted SMEs [center quarterly reports; survey of banks]

Stakeholder Organization

* growing portfolio of loans to modernizing SMEs in the region; lower loan default rates for SMEs; well-accepted new financial products for modernizing SMEs enabled by leveraging public investment [reports from, surveys of banks]

National Sponsor

* limited access to capital cited less frequently as significant barrier to SME modernization; XX% of top 50 regional banks in U.S. identify an extension center as a valued business ally [surveys of SMEs; surveys of banks]

Utilities

Regional Center

* senior liaison established with each major regional utility; XX% of prospect referrals from utilities; conducts professional development exchanges between center consulting staff and utility technical assistance staff; utility staff participate in appropriate center projects; center customers have lower energy costs and fewer problems with power quality than comparable unassisted SMEs [center quarterly reports; survey of SMEs]

Stakeholder Organization

* growing base of SME customers; increasing energy efficiency of SME customers contributes to demand management goals [survey of utilities]

National Sponsor

* EPRI and GRI report that XX% of their members have worked productively with an extension center; lower % of SMEs site energy issues as a barrier to modernization [survey of EPRI and GRI members; survey of SMEs]

Caveats. I was asked to focus on means to evaluate our progress in building the relationships necessary in a mature modernization system -- the phases in optimizing the Big Tables at which many stakeholders compose their various interests in consortial action supporting regional industrial modernization. Obviously there is another class of measures that focuses on the national economic and policy outcomes achieved by a mature manufacturing modernization system. I am eager to explore these result metrics with fellow conferees.

The milestones and means of confirmation sketched above lack the satisfying precision of the Performance Benchmarking metrics, fail in most instances to address the always useful question "compared to what," and are usually cast in a bilateral center/stakeholder mode. Believing that regional alliances among distinct stakeholders groups are a very important attribute of the mature modernization system we seek, I hope our conference can propose better quantitative measures of advancement on this front than I have been able

to offer in this note. If not, then case studies will be our primary means to evaluate progress in center-supported, intra-regional stakeholder cooperation. I look forward to our discussions.

Evaluation in a Broader Perspective: Discussion

Osterman. I think there's a lot at stake for NIST and for broader issues of public policy. NIST is the only game in town in terms of demand side intervention--all other rhetoric is on the supply side. NIST's success has great implications for the future of demand side intervention. I think manufacturing performance is a better goal for NIST than competitiveness (which involves a zero sum).

There are two kinds of challenges to evaluating the NIST programs. First, although manufacturing productivity is rising, manufacturing wages and employment are not going up. Second, the evaluation cycle in Washington, D.C. is very fast. The reason is that the level of sophistication in D.C. is quite high. Programs do tend to live, but they can die or contract as a result of bad evaluations.

The national data show that we can't predict success. But that's because analysts can only control for standard measures, e.g., employment, SIC. At the national level, profit improvements or rate of return strike me as intermediate impacts. Those aren't the right ultimate outcomes. What would a citizen or congressman want to get from his or her dollar? One possible measure of success is job creation; another is job retention; yet another is firm survival--are NIST-assisted firms more likely to survive than unassisted firms?

I've noticed a natural division between program operators and the national center. Program operators may be right in saying that the national center requires too much data. But program operators also want to keep themselves going. They may even try hide problems.

Finally it seems that from an academic point of view there is an opportunity to learn about how firms learn and strategize and then there is an opportunity to learn about how governments can interact.

Gillman. The technology extension program is part of a larger effort involving "competitiveness," which is defined as the ability to maintain or increase industry market share while at the same time increasing standard of living. Other parts of this larger effort include changes in private management behavior, education, regulatory reform, and worker training. Evaluation of partnerships with industry to develop new technologies is really difficult. A major difficulty is that these efforts are intended to create new processes and products that will make us richer down the years.

As for technology extension programs, keep in mind the effort is not intended to be a zero sum game, in which extension program-served firms take business from firms not served. Although not all firms need extension services, we should be able to serve large numbers of firms. A great many supplier-chain companies can benefit from extension assistance without having to take business from some other, unserved firm. I agree with Paul Osterman that profit making is not exactly a visionary goal for us; however, extension programs should not be judged solely by job creation. Job retention is more a more appropriate near-term standard. Job creation is a long run result; for example, the Bureau of Economic Analysis found that firms using technology create more and better jobs over the long run. But you can't wait to evaluate the program's results that far in the future. Better performance from manufacturers is the ultimate measure.

Although there is a great demand for evaluation in Washington, the technology extension program has been under less pressure for evaluation than the R&D partnerships. The program is in a honeymoon period, in part because of the small funding involved. An analysis of return on public investment will probably be asked for. The question of whether somebody else in the private sector could provide extension services hasn't risen much because no one else is providing these services to SMEs in an objective, affordable manner.

I was very intrigued with Jack Russell's vision of the other stakeholders, particularly large manufacturers and trade associations. It should be in large manufacturers' interest to have good suppliers, and trade associations are turning their attention more to technology issues.

Mendelowitz. In similar programs, the evaluation metric is jobs created or saved, and what it costs per job created or saved.

S. Martin. If the pharmaceutical industry can say something about the cost of saving a life, that is a monumentally different task than estimating the cost of a job.

Shapira. The sustenance of the program may not come down to evaluation at all. Broader political perspectives may be more important.

Malecki. No fancy cost-benefit metric will overwhelm the media. Why not have an 800 number and logos? That is more consistent with the age we live in than evaluation metrics.

Russell. People have the right to ask, what is the return on investment? The historical productivity growth rate is 1.3 percent. If one were able to double that and apply prevailing tax rates, the returns at the federal level would be several fold.

Mendelowitz. I wouldn't underestimate the potential for productivity increases that can flow from better information. For example, 15 years ago, Xerox was getting productivity increases three times the U.S. average, and thought that it was doing well. However, despite this relatively good performance in the context of overall U.S. productivity growth, Xerox's Japanese competitors were getting productivity increases 10 times the U.S. average.

Jones. I think the interest in return on investment will grow. We are on the look out for great ways to measure return on investment because everyone expects more services for the same money. Every sector is cutting back, so the feeling is that it is government's turn to cut back.

Shapira. What are we experimenting with? In visiting centers around the country, they all say they are doing something different but when you get down to the agent level, there are more similarities than differences. What we are really experimenting with is a way of organizing a national vision and implementing it locally. This is a very American problem. There are needs that everyone agrees with and we're trying to figure out how to meet these needs. That's why there is tremendous variety among organizations and metrics. The best we'll get to is a package of leading metrics.

Russell. One of the things we're not doing is establishing a national profile of what field agents do that is consistent and strong. That is problematic for government to create because of the many local variations.

Shapira. There was an earlier attempt at NIST to develop a national model--the center, satellite, gateway model. But the model was very difficult to sell because each state took a different approach. The wide variations among states is why there will never be a McDonald's franchise approach to industrial extension.

L. Martin. All these programs preach continuous improvement to their manufacturing customers, but continuous improvement starts at home. Continuous improvement starts with consistency. Programs are delivering the same basic service, but using different tools to do so.

Pounds. Although we in the centers have appreciated being able to design the program as we want, now the centers are crying out for consistency.

Oldsman. Consistency enables planned experimentation, much as McDonalds does in testing new products. The problem is that now we have unplanned experiments. I would argue for consistency and quality assurance, to enable us to understand the essential components of the service that differentiate the product.

Haines. To standardize you have to have data and measurements and we aren't to that point.

Leventhal. And we need a common language--do we agree what a network is? an interaction with a company ?

Sabel. Program improvement will never happen if it has to depend on a common language. Many of the centers engage in at least some continuous improvement efforts, but not in a way to satisfy the minimum need for comparability. At the least you'd want to continue these improvement efforts while controlled experiments are occurring.

L. Martin. It would be better to go into firms and ask them what their three greatest problems are and then come back with sources for answers to these problems. The field agent good with plant layouts is not providing value if mostly what he does is plant layouts.